

# **EXHIBIT F**

# **Subprime Mortgage Credit Derivatives**

LAURIE S. GOODMAN  
SHUMIN LI  
DOUGLAS J. LUCAS  
THOMAS A. ZIMMERMAN  
FRANK J. FABOZZI



WILEY

John Wiley & Sons, Inc.

Copyright © 2008 by John Wiley & Sons, Inc. All rights reserved.

Published by John Wiley & Sons, Inc., Hoboken, New Jersey.  
Published simultaneously in Canada.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning, or otherwise, except as permitted under Section 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400, fax (978) 646-8600, or on the web at [www.copyright.com](http://www.copyright.com). Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, (201) 748-6011, fax (201) 748-6008, or online at <http://www.wiley.com/go/permissions>.

**Limit of Liability/Disclaimer of Warranty:** While the publisher and author have used their best efforts in preparing this book, they make no representations or warranties with respect to the accuracy or completeness of the contents of this book and specifically disclaim any implied warranties of merchantability or fitness for a particular purpose. No warranty may be created or extended by sales representatives or written sales materials. The advice and strategies contained herein may not be suitable for your situation. You should consult with a professional where appropriate. Neither the publisher nor author shall be liable for any loss of profit or any other commercial damages, including but not limited to special, incidental, consequential, or other damages.

For general information on our other products and services or for technical support, please contact our Customer Care Department within the United States at (800) 762-2974, outside the United States at (317) 572-3993, or fax (317) 572-4002.

Wiley also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic books. For more information about Wiley products, visit our web site at [www.wiley.com](http://www.wiley.com).

*Library of Congress Cataloging-in-Publication Data:*

Subprime mortgage credit derivatives / Laurie S. Goodman ... [et al].  
p. cm.—(The Frank J. Fabozzi series)  
Includes index.  
ISBN 978-0-470-24366-4 (cloth)  
1. Mortgage loans—United States. 2. Mortgage loans—United States—Statistics. 3. Secondary mortgage market—United States. I. Goodman, Laurie S.  
HG2040.15.S825 2008  
332.63'244—dc22

2008014507

Printed in the United States of America.

10 9 8 7 6 5 4 3 2 1

EXHIBIT 1.5 Loan and Borrower Characteristics by Product Type

	Agency	Jumbo Prime	Alt-A	Subprime
Lien	1st	1st	1st	1st
Loan limit	≤ Agency	> Agency	None	None
Average loan size	221,301	509,913	293,719	185,451
2006 Avg. loan size	230,403	577,022	320,828	210,472
Credit	Agency	A	A/A-	A-/C
Average FICO	725	739	712	628
2006 Avg. FICO	723	740	708	626
Average LTV	71	69	74	81
2006 Avg. LTV	73	71	75	81
Average CLTV	—	71	80	86
2006 Avg. CLTV	—	75	82	87
Occupancy (owner)	95%	99%	85%	95%
Full documentation	—	50%	23%	60%
Loan purpose				
Purchase	39%	46%	46%	40%
Cash out	59%	23%	36%	53%
Rate refi		30%	18%	7%
IO	9%	45%	43%	20%
ARMs	12%	52%	63%	73%
DTI	—	33%	36%	41%

Source: Fannie Mae, Freddie Mac, and LoanPerformance.

### Combined Loan-to-Value Ratio

The CLTV ratio is the single most important factor determining credit performance on a loan. The *loan-to-value* (LTV) ratio refers to the loan amount divided by the value of a home. Thus, if there is a \$160,000 loan (mortgage) on a \$200,000 home, we would say the LTV ratio is 80% (\$160,000/\$200,000). The CLTV ratio is the sum of the first and second mortgages divided by the home's value. Thus, if there is a \$160,000 first mortgage and a \$30,000 second mortgage] against a \$200,000 home value, we would say the borrower has a CLTV ratio of 95% (\$190,000 mortgages/\$200,000 value of home).

## CHAPTER 7

## The ABX and TABX Indices

**M**any market participants who have historically not been active in the U.S. mortgage markets have turned to the ABX indices as a way to express their views on mortgage credit. In this chapter, we take a careful look at the ABX indices, as well as the TABX indices: how they are constructed and their trading mechanics. In Chapter 11, we look at pricing.

### BACKGROUND

Trading in the home equity asset-backed credit default benchmark indices, hereafter referred to as *ABX indices* or *ABX.HE indices*, commenced January 2006. The trading is offered by CDSIndexCo, a consortium of 16 credit derivative desks.<sup>1</sup> All members (except for HSBC) contribute to the ABX indices, which are managed by Markit Group. These two organizations also offer and manage trading of the Dow Jones CDX indices, which are the most actively traded corporate CDS indices.

The ABX.HE indices consist of five separate subindices, one for each of the rating categories: AAA, AA, A, BBB, and BBB-. Appropriately, the names of the five subindices are ABX.HE.AAA, ABX.HE.AA, ABX.HE.A, ABX.HE.BBB, and ABX.HE.BBB-. Each subindex consists of 20 tranches (of the same rating as the rating category for that particular subindex) from the 20 HEQ ABS deals, with each deal represented once in each subindex.

A new set of ABX.HE indices is launched every six months on January 19 and July 19, referred to as *roll dates*. As of November 2007, four sets of ABX indices are outstanding: ABX 06-1, ABX 06-2, ABX 07-1, and ABX 07-2.<sup>2</sup>

<sup>1</sup> Members of that group are Bank of America, Barclays Capital, Bear Stearns, BNP Paribas, Citibank, Credit Suisse, Deutsche Bank, Goldman Sachs, HSBC, JPMorgan, Lehman, Merrill Lynch, Morgan Stanley, RBS Greenwich Capital, UBS and Wachovia.

<sup>2</sup> Given the limited subprime issuance during the second half of 2007, ABX 08-1 was not released on the January 19, 2008 roll date.



Closing midmarket prices are published daily for each set of ABX indices. The administrator, Markit, employs a filtering process similar to that used by the British Banker's Association to calculate LIBOR. This entails taking the quotes received, discarding those in the top and bottom quartiles, then calculating an arithmetic mean of the remainder. To calculate the official fixing value for a particular subindex, the administrator must receive closing midmarket prices from the greater of (1) 50% of ABX.HE contributors or (2) five ABX.HE contributors. If, on any date, the administrator receives fewer closing prices for a subindex than the minimum fixing number, no fixing number is published for that date.

#### **HOW A DEAL GETS INTO THE INDEX**

To be eligible for inclusion in the semiannual ABX.HE indices, a deal must:

- Be greater \$500 million.
- Have a weighted average FICO score less than or equal to 660 on its issuance date.
- Consist of 90% first lien loans.
- Have tranches with ratings of AAA, AA, A, BBB, and BBB-.
- Have issued the five required tranches within the six months prior to the applicable semiannual roll date (e.g., all deals included in the 1/19/2007 launch issued their five required tranches between 7/20/2006 and 1/19/2007).
- Have an average life at issuance (based on deal pricing speeds) of that is not less than five years for the required AAA tranche, and for years for the other four required tranches.
- Have the 25th of each month as the scheduled interest payment date for all five required tranches.
- Have a floating rate interest based on one-month LIBOR for all five required tranches.
- Be listed on Bloomberg the identity and principal economic terms of each of the five required tranches.

Each set of semiannual ABX.HE indices consists of one deal from each of the "top 20" issuers. That group is selected based on total issuance volume for a six-month period just prior to the roll date for that set of indices. It is important to reemphasize that all the indices done at a particular time contain the same set of deals. That is why the inclusion criteria require the deal to have a tranche with each of the rating levels for which there are indices (AAA, AA, A, BBB, and BBB-). The deal included from each issuer

is (1) based on a poll of the 15 consortium deals<sup>3</sup> and (2) selected from each issuer's two largest deals.

Of deals eligible for inclusion in the ABX Index, if more than four have the same originator or more than six have the same servicer, then deals from the "top 20" will be replaced by deals from the next five top issuers (i.e., issuers ranked #21 to #25). Exhibit 7.1 shows the deals in each of the first four ABX indices.

**EXHIBIT 7.1** Deals in ABX HE Indices

Index	Deals
ABX-HE 06-1	<p>ACE Securities Corp. Home Equity Loan Trust, Series 2005-HE7 Asset Backed Pass-Through Certificates (ACE 05-HE7)</p> <p>Asset-Backed Pass-Through Certificates, Series 2005-R11 (AMSI 05-R11)</p> <p>Argent Securities Inc. 05-W2 (ARSI 05-W2)</p> <p>Bear Stearns Asset Backed Securities I Trust 2005-HE11 (BSABS 05-HE11)</p> <p>CWABS Asset-Backed Certificates Trust 2005-BC5 (CWL 05-BC5)</p> <p>First Franklin Mortgage Loan Trust, Series 2005-FF12 (FFML 05-FF12)</p> <p>GSAMP Trust 2005-HE4 (GSAMP 05-HE4)</p> <p>Home Equity Asset Trust 2005-8 (HEAT 05-8)</p> <p>J.P. Morgan Mortgage Acquisition Corp. 2005-OPT1 (JPMAC 05-OPT1)</p> <p>Long Beach Mortgage Loan Trust 2005-WL2 (LBMLT 05-WL2)</p> <p>MASTR Asset Backed Securities Trust 2005-NC2 (MABS 05-NC2)</p> <p>Merrill Lynch Mortgage Investors Trust, Series 2005-AR1 (MLMI 05-AR1)</p> <p>Morgan Stanley ABS Capital I Inc. Trust 2005-HE5 (MSAC 05-HE5)</p> <p>New Century Home Equity Loan Trust 2005-4 (NCHET 05-4)</p> <p>RASC 05-KS11 TR (RASC 05-KS11)</p> <p>RAMP 05-EFC4 TR (RAMP 05-EFC4)</p> <p>Securitized Asset-Backed Receivables LLC Trust 2005-HE1 (SABR 05-HE1)</p> <p>Soundview Home Loan Trust 2005-4 (SVHE 05-4)</p> <p>Structured Asset Securities Co Mortgage Loan Trust 05-WF4 (SASC 05-WF4)</p> <p>Structured Asset Investment Loan Trust 2005-HE3 (SAILT 05-HE3)</p>
ABX-HE 06-2	<p>Structured Asset Securities Corporation Mortgage Loan Trust 2006-WF2 (SASC 06-WF2)</p> <p>Merrill Lynch Mortgage Investors Trust Mortgage Loan Asset-Backed Certificates, Series 2006-HE1 (MLM 06-E1)</p> <p>RASC Series 2006 KS3 Trust (RASC 06-KS3)</p> <p>Long Beach Mortgage Loan Trust 2006 1 (LBMLT 06-1)</p> <p>CWABS Asset-Backed Certificates Trust 2006-8 (CWL 06-8)</p> <p>Morgan Stanley ABS Capital I Inc. Trust 2006-WMC2 (MSAC 06-WMC2)</p> <p>Argent Securities Trust 2006-W1 (ARSI 06-W1)</p> <p>FFMLT Trust 2006-FF4 (FFML 06-FF4)</p> <p>ACE Securities Corp. Home Equity Loan Trust, Series 2006-NC1 (ACE 06-NC1)</p> <p>Soundview Home Loan Trust 2006-OPT5 (SVHE 06-OPT5)</p> <p>Structured Asset Investment Loan Trust 2006-4 (SAIL 06-4)</p> <p>GSAMP Trust 2006-HE3 (GSAMP 06-HE3)</p>

<sup>3</sup> The consortium includes the 16 credit derivative desks comprising CDSIndexCo, which trade the ABX indices, excepting HSBC.

**EXHIBIT 7.1** (Continued)

Index	Deals
ABX-HE 06-2	J.P. Morgan Mortgage Acquisition Corp. 2006-FRE1 (JPMAC 06-FRE1) Ramp Series 2006-NC2 Trust (RAMP 06-NC2) Home Equity Asset Trust 2006-4 (HEAT 06-4) Bear Stearns Asset-Backed Securities I Trust 2006-HE3 (BSABS 06-HE3) MASTR Asset-Backed Securities Trust 2006-NC1 (MABS 06-NC1) Carrington Mortgage Loan Trust, Series 2006-NC1 (CARR 06-NC1) Securitized Asset-Backed Receivables LLC Trust 2006-OP1 (SABR 06-OP1) Morgan Stanley Capital I Inc. Trust 2006-HE2 (MSCT 06-HE2)
ABX-HE 07-1	Fremont Home Loan Trust 2006-3 (FHLT 06-3) Home Equity Asset Trust 2006-7 (HEAT 06-7) Long Beach Mortgage Loan Trust 2006-6 (LBMLT 06-6) CWABS Asset-Backed Certificates Trust 2006-18 (CWABT 06-18) Morgan Stanley ABS Capital I Inc. Trust 2006-HE6 (MSAC 06-HE6) RASC Series 2006-KS9 Trust (RASC 06-KS9) Structured Asset Securities Corporation Mortgage Loan Trust 2006-BC4 (SASC 06-BC4) C-BASS 2006-CB6 Trust (CBASS 06-CB6) J.P. Morgan Mortgage Acquisition Trust 2006-CH2 (JPMMA 06-CH2) MASTR Asset-Backed Securities Trust 2006-NC3 (MABST 06-NC3) Merrill Lynch Mortgage Investors Trust, Series 2006-HE5 (MLMIT 06-HE5) Securitized Asset-Backed Receivables LLC Trust 2006-HE2 (SABRT 06-HE2) Soundview Home Loan Trust 2006-EQ1 (SVHLT 06-EQ1) FFMLT Trust 2006-FF13 (FFMLT 06-FF13) GSAMP Trust 2006-HE5 (GSAMPT 06-HE5) ABFC 2006-OPT2 Trust (ABFCAB 06-OPT2) ACE Securities Corp. Home Equity Loan Trust, Series 2006-NC3 (ACE-HELT 06-NC3) Bear Stearns Asset-Backed Securities I Trust 2006-HE10 (BSABST 06-HE10) Carrington Mortgage Loan Trust, Series 2006-NC4 (CARRMLT 06-NC4) Citigroup Mortgage Loan Trust 2006-WFHE3 (CITIMLT 06-WFHE3)
ABX-HE 07-2	ACE Securities Corp. Home Equity Loan Trust, Series 2007-HE4 (ACE-HELT 07-HE4) Bear Stearns Asset-Backed Securities I Trust 2007-HE3 (BSABST 07-HE3) Citigroup Mortgage Loan Trust 2007-AMC2 (CITIMLT 07-AMC2) CWABS Asset-Backed Certificates Trust 2007-1 (CWABT 07-1) First Franklin Mortgage Loan Trust, Series 2007-FF1 (FFMLT 07-FF1) GSAMP Trust 2007-NC1 (GSAMPT 07-NC1) Home Equity Asset Trust 2007-2 (HEAT 07-2) HSI Asset Securitization Corporation Trust 2007-NC1 (HISAST 07-NC1) J.P. Morgan Mortgage Acquisition Trust 2007-CH3 (JPMMA 07-CH3) Merrill Lynch First Franklin Mortgage Loan Trust, Series 2007-2 (MLFFMLT 07-2) Merrill Lynch Mortgage Investors Trust, Series 2007-MLN1 (MLMIT 07-MLN1) Morgan Stanley ABS Capital I Inc. Trust 2007-NC3 (MSAC 07-NC3) Nomura Home Equity Loan, Inc., Home Equity Loan Trust Series 2007-2 (NHELI 07-2) NovaStar Mortgage Funding Trust, Series 2007-2 (NSMFT 07-2)



**EXHIBIT 7.1** (Continued)

Index	Deals
ABX-HE 07-2	Option One Mortgage Loan Trust 2007-5 (OOMLT 07-5) RASC Series 2007-KS2 Trust (RASC 07-KS2) Securitized Asset-Backed Receivables LLC Trust 2007-BR4 (SABRT 07-BR4) Structured Asset Securities Corporation Mortgage Loan Trust 2007-BC1 (SASC 07-BC1) Soundview Home Loan Trust 2007-OPT1 (SVHLT 07-OPT1) WaMu Asset-Backed Certificates WaMu Series 2007-HE2 (WMHE 07-HE2)

Source: Markit.

In practice, deals selected for the index tend to closely mirror production over the period in terms of characteristics and credit performance. Note that deal issuance in the first half of 2006 (which comprises ABX 06-2) is actually made up of loans originated three months earlier (Q4 2005–Q1 2006). In Exhibit 7.2, we show characteristics of the 06-1, 06-2, 07-1, and 07-2 indices versus those of loans originated during the same period. They are consistently very close: the *combined loan-to-value ratio* (CLTV), silent seconds, purchase percentage, FICO scored, *interest-only loans* (IO), and 40-year mortgages. The only factors on which they significantly differ are the percentage of second lien mortgages and the percentage of *adjustable rate mortgages* (ARMs)—the index has less of both than were originated (as there are separate pools that consist only of second- lien mortgages or only of fixed rate mortgages). For example, ABX 06-2 had 4% second lien mortgages, while 8% of mortgages originated during that time had second lien mortgages. Similarly, ABX 06-2 had 84% ARMs, versus 79% for the collateral originated at the same time. It is important to emphasize that 15% to 20% of the collateral backing floating rate subprime deals are actually fixed rate mortgages. However, the origination share of subprime fixed rate mortgages are larger than what can be accommodated within these deals. Thus, fixed rate mortgages not used in floating rate subprime pools are securitized in separate fixed rate deals.

Exhibit 7.3 shows delinquency behavior of each of the indices versus that of loans originated at the same time. The data reported in this exhibit reinforces the point that the ABX indices tend to mirror the underlying production.

## INDEX MECHANICS

For the purpose of index pricing, each of the 20 tranches within each sub-index will be assigned an initial weight of 5%, regardless of tranche or

However, in late June 2007, the market reevaluated its loss expectations on 2006-issued ABS securities. It was clear that (1) losses were high enough to hit the A rated securities on some of the deals; and (2) prices on the BBB and BBB- descended to the level at which upside and downside were more balanced (while the A had only downside). Exhibit 7.6B shows that the spread between the A and BBB index reached 25 points. At that juncture, hedgers started to short the A, and it gained liquidity. In September 2007, as loss expectations deepened further and it became very difficult to take out a new subprime mortgage, two things became clear. First, the AA securities would suffer some losses on some of the deals. Second, the 34 point spread between the AA and A was too wide. This is shown in Exhibit 7.6C. The AAs and eventually the AAAs began to decline in price.

It is important to realize that the ABX is the only direct, relatively liquid way for an investor to take a short position in mortgage credit. In late 2006 and early 2007, short positions in the ABX were primarily macroeconomic hedge funds looking for a way to short mortgage credit. By April 2007, it was clear to the dealer community that the subprime crisis was deepening. Dealers had a considerable amount of mortgage risk and looked to short the ABX to hedge the risk. In fact, to hedge their risk, most dealers were short the ABX, short whatever they could accumulate in the illiquid single-name default swap market, as well as short the CDS and equities of mortgage-related corporate entities. The bottom line is that in late 2007, there were many natural sellers of mortgage credit (including hedge funds and the dealer community), but few natural buyers. Thus, it is not surprising that most models had ABX prices considerably above their actual levels.

#### **ABX TRANCHE TRADING**

*ABX tranches* (TABX), the benchmark index tranche product in CDS of ABS, began trading on February 2007. It was designed to promote standardization, liquidity, and transparency.

The TABX tranches reference a portfolio of 40 names, which are the most recent (as of the formation date for that TABX tranche): two sets (of 20 each) reference obligations for the ABX.HE series of a similar rating. The first set of reference obligations to be tranching were the 40 names in the ABX 06-2 and ABX 07-1 indices. That was followed by the 40 names in the ABS 07-1 and ABX 07-2 indices. Two tranche baskets for each set of indices are used: BBB and BBB-, each with distinct attachment and detachment points, as shown in Exhibit 7.7.

Thus, the TABX.HE.07-1.06-2.BBB3-7 refers to the TABX that combines the reference entities of 07-1 and 06-2 at the BBB level. The "3-7"

**EXHIBIT 7.7** Attachment/Exhaustion Points: ABX Tranche Trading

Equivalent Rating	BBB Index	BBB- Index
AAA Super Senior	35–100	40–100
AAA Mezzanine	20–35	25–40
AA	12–20	15–25
A	7–12	10–15
BBB	3–7	5–10
Equity	0–3	0–5

Source: UBS.

refers to the attachment and detachment points; that is, the points of exposure to the capital structure. Thus, 3–7 means that the bond attaches if losses on the 40 underlying BBB credits exceed 3%, it detaches if losses on the 40 underlying BBB credits exceed 7%. Similarly, the TABX.HE.07-1.06-2BBB-5-10 refers to the TABX that combines the reference entities of 07-1 and 06-2 and the BBB- level, with “5-10” referring to attachment/detachment points. Thus, if losses on the underlying BBB- bonds exceed 5%, the TABX 5-10 index will experience losses; if losses exceed 10%, it will experience a total loss of principal.

Pricing for the indices as of November 9, 2007, along with their coupon, is shown in Exhibit 7.8. Note that this index trades on a price basis. The coupon for each tranche is determined by a dealer poll, such that the initial price will be 100. The exception is that the coupon for each tranche is capped at +500; thus in distressed markets, we would expect the indices to begin trading at a discount.<sup>4</sup>

### **TABX PRICING**

Theoretically, the weighted average price of the TABX BBB subindex should be approximately equal to the average price of the underlying ABX subindices, corrected for any coupon differential.<sup>5</sup> That is, since the same bonds are contained in both indices, the arbitrage should hold.

<sup>4</sup> In fact, that's exactly what happened. Exhibit 7.8 shows that on TABX 07-2.07-1, four of the six BBBs had a coupon equal to the maximum, hence sold at a discount at origination.

<sup>5</sup> There are no interest shortfalls on the TABX. It will always pay the full stated coupon on the reference bonds, regardless of possible interest shortfalls on the underlying ABS names, whereas the ABX index passes through shortfalls up to the spread premium.

**EXHIBIT 7.8** TABX Coupon and Prices

Index	11/9/07	
	Coupon	Price
TABX-HE 07-1 06-2 BBB 0-3	500	15.45
TABX-HE 07-1 06-2 BBB 3-7	500	17.59
TABX-HE 07-1 06-2 BBB 7-12	500	19.62
TABX-HE 07-1 06-2 BBB 12-20	467	21.05
TABX-HE 07-1 06-2 BBB 20-35	200	21.46
TABX-HE 07-1 06-2 BBB 35-100	51	25.97
TABX weighted average:	161	23.93
Average on ABX BBB 07-1 06-2	179	19.04
TABX-HE 07-1 06-2 BBB 0-5	500	11.91
TABX-HE 07-1 06-2 BBB 5-10	500	13.68
TABX-HE 07-1 06-2 BBB 10-15	500	14.18
TABX-HE 07-1 06-2 BBB 15-25	500	15.00
TABX-HE 07-1 06-2 BBB 25-40	267	14.65
TABX-HE 07-1 06-2 BBB 40-100	72	15.27
TABX weighted average:	208	14.85
Average on ABX BBB 07-1 06-2	316	17.93
TABX-HE 07-2 07-1 BBB 0-3	500	18.00
TABX-HE 07-2 07-1 BBB 3-7	500	19.00
TABX-HE 07-2 07-1 BBB 7-12	500	20.18
TABX-HE 07-2 07-1 BBB 12-20	500	22.20
TABX-HE 07-2 07-1 BBB 20-35	500	24.01
TABX-HE 07-2 07-1 BBB 35-100	410	36.84
TABX weighted average:	442	31.63
Average on ABX BBB 07-2 07-1	362	19.65
TABX-HE 07-2 07-1 BBB 0-5	500	16.03
TABX-HE 07-2 07-1 BBB 5-10	500	17.81
TABX-HE 07-2 07-1 BBB 10-15	500	19.19
TABX-HE 07-2 07-1 BBB 15-25	500	20.44
TABX-HE 07-2 07-1 BBB 25-40	500	21.44
TABX-HE 07-2 07-1 BBB 40-100	410	28.05
TABX weighted average:	446	24.74
Average on ABX BBB 07-2 07-1	445	18.52

Source: Markit.



In Exhibit 7.8, using 11/9/2007 closes, we show that there can be sizeable discrepancies between TABX pricing and the underlying ABX tranches. Note that for TABX07-1.06-2, the weighted average price (each price weighted by the width of the slice) of the BBB tranches is 23.93. The BBBs on ABX 06-2 were selling at 19.57, and the BBBs on ABX 07-2 were at 18.5, for an average of 19.04 and a differential of 4.89. The coupon on the ABX BBB indices was 179 bps, while the average coupon of the TABX was 161 bps. Even if we expect this 16 bps differential to be received for four years, that only explains part of the 4.89 price differential. Exhibit 7.8 shows that price differentials between the TABX 07-2.07-1 and the underlying ABX indices exceeded the price differentials between TABX 07-1.06-2 and the underlying ABX indices. For example, with almost no coupon differential, the TABX 07-2.07-1 was \$6.22 higher than the underlying ABX indices.

As a practical matter, the differences cannot be simply arbitrated out. Liquidity and bid-ask spreads keep the indices from pricing on top of one another. In fact, the differentials were larger on the TABX 07-2.07-1 relative to the ABX than on TABX 07-1.06-2 relative to the ABX, reflecting the fact that the newer TABX was traded less frequently than the older TABX. It is important to realize that the ABX is a more liquid market than the TABX, so the former is the market used to hedge positions. With the large numbers of natural shorts, and relatively few natural longs, it is no surprise that the ABX is the more depressed of the two alternatives.

### **TABX VERSUS CDOs**

A number of investors have attempted to value the less liquid CDO market by importing valuations from the more transparent TABX market. That approach is misguided.

While *attachment points* may be vaguely similar, the *bonds* may be very different, so any type of valuation imported from the TABX market will be suspect. And, as we will show in Chapter 11, collateral from the 2005 vintage was expected to experience significantly lower losses than that from the 2006 vintage. Let's take an early-2007 CDO deal (which was probably 10% cash collateral and 90% synthetic collateral). The 10% cash collateral was most likely similar to that backing 07-1, as the CDO manager was tied to new deal activity. However, the 90% synthetic component could vary tremendously in quality. At one extreme, it could look just like the cash securities, which given their vintage were most likely poor quality. At the other extreme, it could consist of very good quality collateral from earlier vintages. Until an investor looks at a CDO's holdings, there is no way of



determining collateral quality and value. Thus, there is no way to use TABX pricing as the benchmark for CDO pricing.

#### **SUMMARY**

---

In this chapter, we looked at ABX and TABX indices, and discussed index composition and trading relationships between the two. We showed that the characteristics of deals underlying the ABX indices reflect very closely the characteristics of the loans produced at the same time, with similar delinquency experience. We also have shown that the ABX is one of the few ways to sell housing credit. Given the number of participants who need or want to go short, it is easy to see that ABX can trade for a lower value than would be indicated by model values or by TABX levels.

## CHAPTER 12

**ABS CDO Losses and Valuation**

In this chapter, we predict mortgage bond losses within the portfolios of ABS CDOs. We look at 420 CDOs and their 20,797 underlying mortgage bonds from 4,259 underlying mortgage loan securitizations. Given the high collateral losses we predict for ABS CDOs, relative value among CDO tranches is dependent on structural idiosyncrasies. Structural terms control when collateral cash flow is cut off to subordinate CDO tranches and how much cash flow is diverted to senior CDO tranches. We find:

- Collateral losses will affect the very top of mezzanine ABS CDO capital structures. We predict that 86% of senior AAA tranches from 2006–2007 vintage subprime mezzanine ABS CDOs will default. Among BBB tranches, we predict 99% will default. These figures are horrific from a ratings and risk management point of view and indicative of the greatest ratings and credit risk management failure ever.
- Losses on mortgage loans underlying bonds owned by ABS CDOs vary greatly by vintage. Subprime loans originated 2006–2007 will have twice the losses of subprime loans originated in 2005. The effect follows through to the mortgage bond level. 2006 subprime mortgage bonds in the CDOs we study will have almost three times the losses of 2005 subprime mortgage bonds.
- The single best predictor of ABS CDO losses is the amount of 2006–2007 collateral they contain. After accounting for this variable, no other objective attribute of CDO collateral quality improves the prediction of collateral losses.
- In the generalized wreckage of subprime and ABS CDOs, there are few relative value opportunities arising from differences in collateral credit quality. But as more ABS CDOs experience event of default, the relative rights of senior and subordinate tranche holders have greater effect on remaining tranche value.

In this chapter, we first look at mortgage loan losses; then, mortgage bond losses; finally, ABS CDO losses. We next discuss patterns of CDO losses, looking at relationships with mortgage bond vintage, CDO closing date, and mortgage loan seasoning. We rely on the methodology discussed in Chapters 2 and 3 to predict underlying mortgage loan losses. Finally, we discuss differences in cash flow structure that drive relative value results.

### **THE MORTGAGE LOAN-MORTGAGE BOND-ABS CDO CHAIN**

To put this chapter in context, it is necessary to understand the relationship among mortgage loans, mortgage bonds, and ABS CDOs. Exhibit 12.1 does just that. At the top left, subprime mortgage loans are made to borrowers with relatively bad credit quality and/or low down payments. These loans are securitized into subprime mortgage bonds; that is, the subprime mortgage loans are the securitization's assets and subprime mortgage bonds are the securitization's liabilities.

Note that the subprime mortgage bonds have various ratings and make up different percentages of the securitization's capital structure. The exhibit simplifies the subprime structure in that multiple tranches actually make up each rating band in the exhibit. For example, there are usually four AAA tranches of varying expected maturities in the securitization. In the other broad rating categories, there are usually tranches rated "plus," "minus," and "plain."

Exhibit 12.1 shows subprime mortgage bonds rated AAA, AA, and A going into high-grade ABS CDOs and BBB subprime bond going into mezzanine ABS CDOs. At various times, so-called "high-grade" ABS CDOs were comprised of higher rated collateral and mezzanine ABS CDOs were comprised of collateral rated A through BB. The exhibit shows typical ABS CDO collateral of 2006–2007 vintages. Finally, A and AA mezzanine ABS CDO tranches sometimes find their way into CDO squareds.

### **MORTGAGE DEAL LOSSES**

The 420 ABS CDOs we study hold mortgage bonds from 4,259 separate mortgage loan securitizations issued from 1997 to 2007. In the top panel of Exhibit 12.2, these securitizations are broken out by deal type: subprime (high LTV and/or B and C rated borrowers), Alt-A, second liens, and prime; and by vintage, 1997–2007. About half (45%) of the mortgage deals in the ABS CDOs we study are subprime, 34% are Alt-A, 5% are seconds, and 17% are prime. Deals are predominately (57%) 2005–2006 vintage.